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Climatic change projections for winter streamflow in Guadalquivir river

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In this work we have obtained climate change projections for winter streamflow of the Guadalquivir River in the period 2071-2100 using the Principal Component Regression (PCR) method.

The streamflow data base used has been provided by the Center for Studies and Experimentation of Public Works, CEDEX. Series from gauging stations and reservoirs with less than 10% of missing data (filled by regression with well correlated neighboring stations) have been considered. The homogeneity of these series has been evaluated through the Pettit test and degree of human alteration by the Common Area Index. The application of these criteria led to the selection of 13 streamflow time series homogeneously distributed over the basin, covering the period 1952-2011. For this streamflow data, winter seasonal values were obtained by averaging the monthly values from January to March.

The PCR method has been applied using the Principal Components of the mean anomalies of sea level pressure (SLP) in winter (December to February averaged) as predictors of streamflow for the development of a downscaled statistical model. The SLP database is the NCEP reanalysis covering the North Atlantic region, and the calibration and validation periods used for fitting and evaluating the ability of the model are 1952-1992 and 1993-2011, respectively. In general, using four Principal Components, regression models are able to explain up to 70% of the variance of the streamflow data.

Finally, the statistical model obtained for the observational data was applied to the SLP data for the period 2071-2100, using the outputs of different GCMs of the CMIP5 under the RPC8.5 scenario. The results found for the end of the century show no significant changes or moderate decrease in the streamflow of this river for most GCMs in winter, but for some of them the decrease is very strong.

Keywords: Statistical downscaling, streamflow, Guadalquivir River, climate change.

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